METAL CASTING

Project Fact Sheet

A Process to Recover and Reuse Sulfur Dioxide in Metalcasting Operations

Pressure swing adsorption will recover 98+% of the sulfur dioxide used in forming cold box molds for metalcasting

Benefits

- Projected energy savings of 75% for a medium sized foundry to recover and reuse SO_2 and the carrier gas
- Captures and reuses SO_2 and the carrier gas without further purification
- Rapid payback
- Eliminates scrubber chemicals for waste treatment

Applications

Pressure swing adsorption to recover and reuse SO_2 can replace the current operation of using SO_2 once and then discarding it by purging the mold with dry air or nitrogen that must be scrubbed with a caustic solution. The process might be applied to other operations that use or produce SO_2 such as lead and copper smelting, food preservation, and flue gases from power plants.

Project Partners

NICE³ Program
Washington, DC

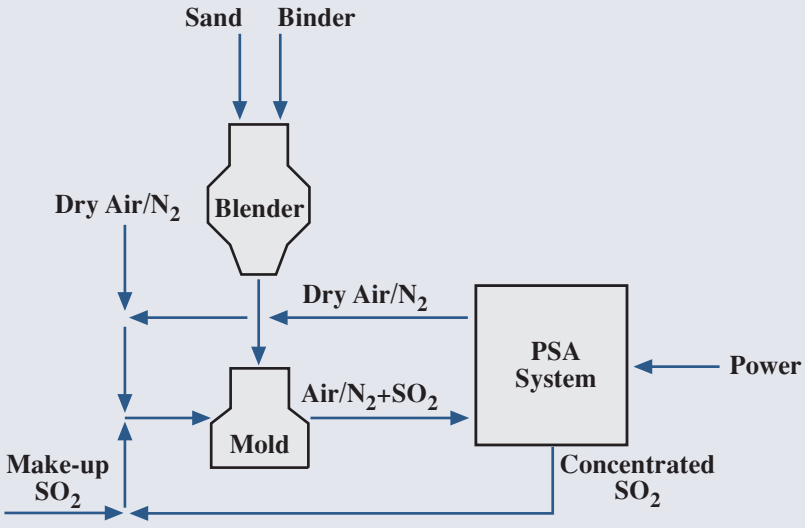
Adsorption Research, Inc.
Dublin, OH

Ohio Department of Development
Columbus, OH

Sulfur dioxide (SO_2) is used as a catalyst in forming cold box molds and cores. The present, wasteful mode of operation uses the SO_2 once, then discards it by purging the mold with dry air or nitrogen. That effluent is then scrubbed (at about 98% efficiency) with a caustic solution, which is then flushed into a sewer or delivered to a waste treatment facility.

The new process is based on pressure swing adsorption, and requires no regenerant; hence, it produces no waste streams. The technology is expected to recover 98+% of the SO_2, which will allow reuse without further purification. The principal operating cost is for power consumed in evacuating the adsorbent vessels during blowdown, and maintaining low pressure during purge. Employing this process will reduce energy consumption, eliminate the need for caustic effluent, and pay back in less than two years.

New PSA-Based System



New sandcasting SO_2 recycling technology using a pressure swing adsorption system for gas recovery instead of a wasteful scrubber system.

Project Description

Goal: The goals of this project are to design and construct a prototype SO_2 recovery and reuse system that will be installed and tested at an operating foundry under realistic conditions.

The adsorption system consists of one or two stages, depending on the application. The pressure swing cycle ensures continuous processing of the foundry off-gases and virtually complete recovery of the excess SO_2. The project includes the design and construction of a pilot-scale prototype using the new pressure swing process. By the end of 2001, it was tested at one foundry currently using a scrubber for waste SO_2. This successfully demonstrated the new technology without disrupting normal operations.

Progress and Milestones

- Final tests on adsorbents are complete. Design and construction of the prototype equipment is also finished.
- The system was tested at a foundry for on-site testing under realistic conditions.
- Evaluation of unit performance and integrity will follow with necessary unit modifications to optimize the system.
- An operation manual will be developed along with a marketing campaign to promote the system while on-site testing continues.

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